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OPEN INNOVATION PROJECT: THE SYSTEM OF ONLINE INDICATORS IN SCIENCE, TECHNOLOGY AND INNOVATION OF AMAZONAS (SiON)

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ABSTRACT

This study aims to evaluate the implementation of an open innovation project in a public institution in the state of Amazonas. The study is characterized as a qualitative and descriptive research, using the case study as a methodological procedure. The universe delimitation was composed by a public institution in the area of science, technology and innovation (ST&I). The case study, was used an approach as tool to assess the implementation of open innovation projects. The results are shown several stages of open innovation project analyzed. The study demonstrates the implications of the open innovation project adoption to the strengthening of external networks and the maturing of the internal environment. The relevance of the study is based on the evaluation of an the open innovation project in a public institution in order to foster the transition from traditional innovation processes to open innovation processes.

Keywords: Open Innovation; ST&I indicators; SiON; Amazonas.

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1. INTRODUCTION

The era of capitalism is going through, not quickly, but inevitably, according to Rifkin (2014). For the author, the new economic paradigm (cooperative communities) is growing from the emergence of a hybrid economy, part capitalist market and part collaborative communities

According Annunziata (2013), we live in the era of industrial internet gathering intelligent machines, analytical advanced and creativity of people at work. For him, the world experienced two waves of innovation: first, the industrial revolution that brought machines, factories, railways, electricity, air travel, among others; and second, the internet revolution, which brought computing power, data networks, with unprecedented access to information and communication.

Added to this scenario, the markets have become more globalized, opening for new opportunities, as well as intensifying the level of competition, with life cycles getting shorter products or pressure resulting in a more intense and global competition with technological progress continuous. Companies are forced to innovate faster and develop more efficient products and services (OECD, 2010a).

In recent decades, the strong global competition has led to the sharing and cooperation of labor between the innovation processes of companies. In various industries, agility, flexibility and concentration are essential skills considered as sources of competitive advantage. The open innovation phenomenon is a complex issue that has received contributions from different streams of research. This innovation process includes several perspectives: (1) globalization of innovation, (2) outsourcing of research and development (R&D), (3) integration with the supplier (4) Users of innovation and (5) foreign trade and application of technology (GASSMANN, 2006).

In this context, open innovation implies that businesses depend on external knowledge assets critical to the successful realization of their innovative ventures (CHRISTENSEN *et al*., 2005). In open innovation, companies share ideas externally (internally also occurs) for the implementation of ways to market (CHESBROUGH, 2003).

Thus, this study aims to evaluate the implementation of an open innovation project in a public institution in the state of Amazonas The work is structured in three

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parts: (1) theoretical and empirical background, dealing on science, technology and innovation (ST&I) indicators and open innovation; (2) methodology, with the study design, research framework, methods of data collection and methods of data analysis; and finally, (3) results in the institution, discussion, conclusion and references.

2. THEORETICAL AND EMPIRICAL BACKGROUND

2.1. Indicators of Science, Technology and Innovation (ST&I)

In the early 60s, the OECD development indicators had focused on the relationship between research and development, this situation has changed in the last 20 years having the discussion expanded to work in areas of innovation; intellectual property; measures for knowledge management, direct and indirect support of technology government programs and R&D (research and development). Thus, there is a need for a systemic approach to the development and classification of these new indicators (GAULT, 2011).

Innovation has become a policy priority in many countries supported by national strategies and large budgets. Subsequently, innovation has taken a central role and many governments have established ministries, departments and offices to support studies, integration and implementation of innovation policies. In order to evaluate the effectiveness of government interventions, various innovation indices have been developed in recent years to measure innovation performance at national and sub-national (MAHROUM & ASALEH, 2012).

Science indicators, technology and innovation (ST&I) have become an essential ingredient in research focusing on operating modes of STI subsystems and their relationship to the larger social system. Dissatisfaction with the R&D indicators was the basis for the successful development of new output indicators in ST&I within the framework of the Oslo Manual (1992). Together with the different surveys waves occurred in the early 90s by different actors, as European Union in applying the Comunnity Innovation Survey (CIS), for example (FREEMNAN & SOETE, 2007).

The first CIS took place in 1993 with the goal of being a major source of data for new innovations at the time. The purpose of the CIS and other surveys of innovation was based on the first edition of the Oslo Manual and sought to overcome some limitations of traditional R&D questionnaires. They had two main goals, provide

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data innovation activities, which were not included in R&D, and provide innovation outputs measures (ARUNDEL, 2007).

The surveys of STI need to be redesigned to broaden the vision of innovation, the goal is to help recognize the important role of STI policies in promoting economic growth. Companies, statistics and research communities are encouraged to work to measure and assess intangible assets, reviewing the framework of measures for innovation and alignment with the administrative and economic data aggregated to allow analysis of productivity. In this context, the OECD Innovation strategy includes a measurement schedule which will be implemented. Political actions need more reflection about the changing nature of innovation; this implies an emphasis on the following areas, according to the agenda (OECD, 2010a):

1. Improve measurement of expansion of innovation and its link to macroeconomic performance;
2. Invest in high quality and more comprehensive data infrastructure to measure the determinants of the impact on innovation;
3. Recognize the role of innovation in the public sector and promote the measure;
4. Promote the development of new statistical methods and interdisciplinary approaches to data collection; and
5. Promote the measurement of innovation for social goals and social impact of innovation.

Another survey is called Nordic Innovation Monitor; the instrument measures the innovation capacity of the OECD countries and highlights areas where innovation needs to be strengthened. It is believed to have been a major impact on innovation capacity four structural conditions are necessary: (1) human resources; (2) knowledge creation; (3) innovation and communication technology (ICT); and (4) entrepreneurship. The Nordic Innovation Monitor measures the strength of the four conditions, as well as their outputs (NORDEN, 2009).

In the United States, after years of lack of innovation indicators, the National Science Foundation (NSF) in cooperation with the economic directory Census

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Bureau redesigned the R&D Survey to produce the Business R&D and Innovation Survey (BRDIS) whose pilot was held in January 2009 (GAULT, 2010).

With regard to more recent indicators of innovation, the publication Measuring Innovation, a new perspective (OECD, 2010b) presents new measures and new ways of looking at traditional indicators; these new indicators attempt to accurately reflect the diversity of actors and processes of innovation and the links between them. The new indicators are divided into six chapters and more than 40 innovation indicators that make up a much broader and comprehensive framework of innovative measures, namely:

1. Innovation today;
2. Empowering people to innovate;
3. Unleashing innovation in firms;
4. Investing in innovation;
5. Reaping returns from innovation; and
6. Addressing global challenges.

In the case of Brazil, in 2001 the Brazilian Institute of Geography and Statistic (IBGE) signed an agreement with the Financier of Studies and Projects (FINEP) to conduct the first survey of Technological Innovation (PINTEC) which resulted in a work group formed by representatives from IBGE, the Ministry of Science Technology and Innovation (MCTI) and FINEP (IBGE, 2002).

PINTEC aims at building national indicators of technological innovation activities in industrial companies, in line with international methodologies in conceptual and methodological terms. The conceptual and methodological framework of the research is the Oslo Manual and the model used by EUROSTAT, Community Innovation Survey (CIS). The universe of survey deals with companies with ten or more employees (IBGE, 2002). The first edition (2000) occurred data for the period 1998 to 2000. The second edition (2003) evaluated data the period from 2001 to 2003, the third edition (2005) evaluated data from 2003 to 2005; the fourth edition (2008), evaluated data from 2006 to 2008 and the fifth and last edition (2011) evaluated the data between the years 2009 and 2011 (IBGE, 2002, 2005, 2007, 2010, 2013).

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As a differential, the third edition of PINTEC (2005) went on to evaluate the activities related to the services which include telecommunications, computer activities and services related to research and development (IBGE, 2007). In the 2008 edition, was an extension of valued services activities with the addition of services, such as, editing and music recording; activities of information technology services; and data processing, internet hosting and other related activities (IBGE, 2010). In the 2011 edition, it started to evaluate innovative activities in biotechnology and nanotechnology (IBGE, 2013).

2.2. Open Innovation

For years the R&D internal process was based on the closed innovation model which successful innovation demanded control. Companies should generate their own ideas and develop, produce, perform marketing, distributing and selling on their own (CHESBROUGH, 2003).

This model worked very well throughout the twentieth century, however at the end of the century a number of factors contributed to the erosion of closed innovation model in the United States. In the open innovation model, combinations of internal and external knowledge to the organization allow to create value while establish internal mechanisms to claim some of this knowledge to the company itself (CHESBROUGH *et al*., 2006).

Three essential processes can be differentiated in the open innovation (ENKEL *et al*., 2009): (1) outside-in process; (2) inside-out process; and (3) coupled process. In work, Gassmann *et al*. (2010) indicates nine perspectives necessary to develop a more complete theory of open innovation; for authors, open innovation is based on these different research streams.

Elsewhere, Dahlander & Gann (2007) seek to identify the types of openings that take place within the framework of Open Innovation and point to opening following characteristics: (1) different levels of informal and formal protection; (2) the number of external innovation sources; and (3) the degree to which companies are relying on formal and informal relationships with other actors. Later, the authors sought to clarify the definition of openness and reconceptualize the idea for future research on the subject combining literature review of all papers published in the

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Web of Knowledge (ISI) with a content analysis to develop a complete understanding of the area (DAHLANDER & GANN, 2010).

Lazzarotti & Manzini (2009) follow the idea in which the opening requires a local or continuity from the exploitation of their different degrees in terms of the number of external sources of innovation. They considered two variables to represent the degree of openness for a company: (1) number or types of partners with whom the company collaborates and (2) the number or types of stages of the innovation process that the company open to external contributions. From these two variables, they identified four open innovation modes: (1) closed innovators, (2) specialized collaborators, (3) integrated collaborators and (4) open innovators. The most common models found were open and closed innovative. In addition, the study shows that there is no better model than another, nor that the open model is the best among the four. In this case, the choice of one model by companies should consider the strategic, organizational and managerial context and accept a balance between the benefits and costs of each.

Other research related to open innovation, carried out by Keupp & Gassmann (2009), the authors sought to understand why some companies conduct open innovation on a larger scale than others and how these companies differ. Unlike other contributions that explaining about these differences as resulting from factors external to the company, the authors explain that the differences result from factors internal to the company, specifically the impediments to innovation.

Four archetypes of companies that differ significantly were identified with respect to the breadth and depth of open innovation and the importance of impediments. The four open innovation user archetypes are: (1) professionals, companies that collaborate extensively as a large number of external sources of knowledge and deep with respect to the intensity of collaboration; (2) explorers, companies that collaborate with a large number of sources, but does not cause the same degree of professional; (3) Scouts, companies that collaborate with various sources, unlike the explorers, their approach include not deep collaborations; and (4) isolationists, companies still prefer to keep their closed innovation activities or just started exploring the open innovation approach (KEUPP & GASSMANN, 2009).

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In the case of Mortara & Minshall (2011), the authors developed a taxonomy implementation of open innovation. This taxonomy consists of four quadrants that are related to revolutionary change and evolutionary aspects and distributed or central location. The implementation of open innovation depends on three factors: (1) innovation requirements, (2) the timing of the implementation and (3) organizational culture. Each of these factors has led to differences in the way it has been implemented open innovation in the companies studied.

In publishing, West & Gallagher (2006) identified three core business challenges for implementing the concept of open innovation: (1) finding creative ways to explore the internal innovation, (2) incorporating external innovation in internal development and (3) motivate external agents support the continued flow of external innovations . These challenges involve a paradox: why companies invest efforts in R&D if the results of these efforts will be available to rival companies?

From this paradox, examined whether the activities of open-source software companies characterized by make investments that will be shared with actual and potential rivals. Four strategies or ways of combining internal and external innovation in open source have been identified: (1) pooled R&D/product development; (2) spinouts; (3) selling complements; and (4) Attraction donated complements.

For Chiaroni *et al*. (2011), the paradigm of open innovation is implemented during the process of three phases comprising the stages unfreezing, moving and institutionalising. For this, the authors sought to answer two important questions related to the subject: (1) understand the relevance of open innovation beyond the high-tech industries and (2) to study how companies implement open innovation in practice. The authors suggest that open innovation as an organizational change process occurs through the sequence unfreezing, moving and institutionalising, as proposed by Lewin (1947) and supplemented by Armenakis & Bedeian (1999). In the case of levels of management to open innovation, identifies four levels where the implementation of open innovation impacts: (1) networks, (2) organizational structures, (3) evaluation processes and (4) Knowledge Management Systems.

Dodgson *et al*. (2006) present a case study of Procter & Gamble demonstrating the great organizational and technological changes associated with open innovation. The attractiveness of open innovation as a business strategy lies in

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how to deal to explore the benefits of importing ideas from outside the company and exporting intellectual capital hitherto idle. The model also enables large corporations to become more entrepreneurial from new forms of finance, supporting start-ups through venture funds and the like.

Finally, as opposed to Chesbrough ideas about open innovation, Trott & Hartmann (2009) mention that the American author has created a false dichotomy by arguing that open innovation is the only alternative to the closed innovation model. The paradigm of open innovation is shown by the contrast with the paradigm of closed innovation. The authors demonstrate that the dichotomy between open and closed innovation may be true in theory, but does not actually exist in the industry. In short, is an old wine in a new bottle.

3. METHODOLOGY

3.1. Study Design

This study, in terms of problem approach is characterized as a qualitative research (SILVA & MENEZES, 2005), with the object a public institution of the state of Amazonas. With regard to its objectives, it is revealed as a descriptive (GIL, 2002), the descriptive research aims to provide greater familiarity with the problem in order to make it explicit or build hypotheses. It involves literature, interviews and analysis of examples. Assume forms of bibliographic research and case studies.

The methodological procedure used was the case study, examining a phenomenon in its natural setting, using multiple data collection methods to gather information from one or few entities, such as, individuals, groups or organizations (BENBASAT *et al*., 1987). The case study works from relational inferences or analytical generality (MEREDITH, 1998; YIN, 1994), seeking to generalize the results of a study to create a theory, in addition to trying to determine if a factor is related to another.

The case study allows (GIL, 2002):

1. Explore real life situations whose boundaries are not clearly defined;
2. To preserve the unitary character of the studied object;
3. Describe the context of the situation particular investigation;

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4. To formulate hypotheses or develop theories;

5. Explain causal variables of a given phenomenon in very complex situations that do not allow the use of surveys and experiments.

The delimitation of the universe was composed by the State Secretary of Science, Technology and Innovation of Amazonas (SECTI). To evaluate deployment of open innovation approach was used to Boscherini *et al*. (2010) consists of three phases (conception, realization and transfer of results) and detailed in item 3.2.

3.2. Research Framework

In the case study, was used the approach presented in Boscherini *et al*. (2010) as tool to assess the implementation of open innovation projects. The approach allows studying how companies plan and managing pilot project through open innovation.

The authors developed a research framework that has been used to collect empirical data and interpret ways to analyze the case studies. The approach consists of three phases (Figure 1):

1. Conception,

2. Realization and

3. Transfer of results.

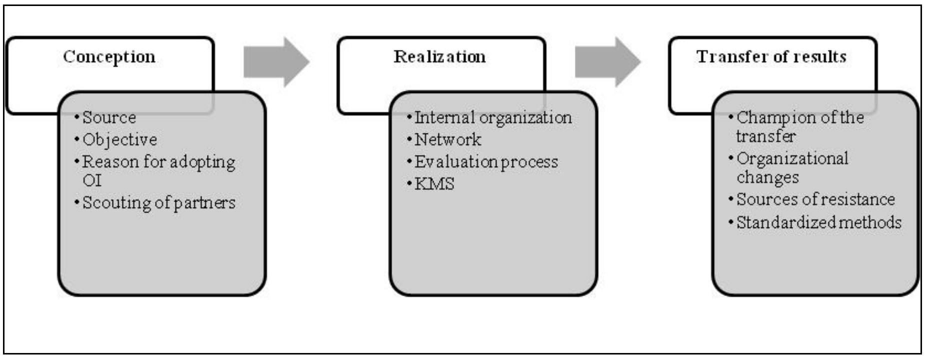

Figure 1: Research Framework
Source: Adapted from Boscherini et al. (2010).

The conception phase consists of the following variables: (1) source; (2) objective; (3) reason for adopting open innovation; and (4) Scouting of partners. During the realization phase, the following variables are adopted by the authors: (1) internal organization; (2) network; (3) evaluation processes; and (4) knowledge management systems. Finally, in transfer of results phase: (1) champion of the

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transfer; (2) organizational changes; (3) sources of resistance; and (4) standardized methods, as variables identified by the authors.

3.3. Methods of Data Collection

The sample was unintentional probabilistic character (MARCONI & LAKATOS, 1990). The research techniques used for realization of the study were: (1) indirect documentation (documental and literature research); and (2) intensive direct observation (interview). The study was conducted in three stages:

1. Occurred survey of secondary information (documental research) through the institution's documents (SECTI), notice and resolution available in FAPEAM the site related to the innovation project.
2. Carried semi-structured interviews (VERGARA, 2009), from a script which identified key information to complement the documentary analysis in the institution previously, with two project participants in order to collect information necessary to achieve the objectives of research. All interviews were tape-recorded and transcribed;
3. The documentary information gathered at first were integrated and triangulated with data collected by interviews with the aim of ensuring the rationalization and validation, as in Boscherini *et al*. (2010).

3.4. Methods of Data Analysis

Qualitative data obtained from answers of the interviews were tabulated in summary table, grouped according to content and stratified according to the structure of the research approach. Documentary information raised at first were integrated and triangulated with data collected by interviews in order to ensure the rationalization and validation.

For analysis of the qualitative data we used the methodology proposed by Kvale (1996) by adopting the following phases of analysis:

1. It began with the subject line from the owner's experience during the interview;
2. Attempted to discover new theme of relationships and how the interviewee watches and put into practice;

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3. During the interview, we tried to condense and interpret the meaning of what the interviewee describes, disseminates and returns on feedback until there is only one possible interpretation or multiple understandings of the subject by the subject;

4. The transcribed interview was interpreted individually. The material and then was structured ran clarification in seeking to eliminate repetitions and distinctions between essential and non-essential. The analysis involved the development of the interview meanings, bringing the understanding of the subject itself, as well as providing new perspectives of researcher on the phenomenon analyzed.

4. RESULTS

4.1. Objective of the Pilot Project

The pilot project developed a system of indicators in science, technology and innovation that would bring together in the same environment the results of various national databases (National Council of Scientific and Technological Development - CNPq, Coordination for the Improvement of Higher Education - CAPES, Brazilian Institute of Geography and Statistics - IBGE) thus allowing the monitoring of policy results state public in this area, in addition to serving as a source, for the scientific community, of technical and scientific studies.

4.2. Conception

The pilot project (source of pilot project) originated internally at the institution where early in the second half of 2010 has identified the need and the importance of monitoring data and information, as well as the need to analyze several variables related to ST&I indicators at the state level, in order to enable the accessibility and optimize the flow of information enabling the analysis of historical data to identify possible trends/scenarios of ST&I in the state, regional and national levels.

In this context, it was added to the transparency of public needs and the ease of data collection available in databases scattered in various organs of this area and the like. Soon, it was necessary to create a ST&I indicator system that would allow measuring the economic and social impacts of investments and actions in the area

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bringing together in a single environment data from various databases (CNPq, CAPES, IBGE and FAPEAM).

In 2010, the SECTI submitted to the support of the Amazonas Research Foundation (FAPEAM) proposal with the main objective of structure a system of indicators that allow measuring the investment and actions in the area carried out by the state of Amazonas and evaluate economic and social impacts of these investments and actions. Among the expected outputs were at:

1. Specification requirements for the development of an internal module of ST&I indicators;
2. Internal indicators module of ST&I constituted a structured database and computerized access system developed in accordance with specified requirements;
3. Implementation in SECTI the internal indicators module developed;
4. Publication in print and digital format for disclosure of indicators of ST&I of Amazonas for the period 2003-2010 from the built database;
5. Specification requirements for developing an external indicators module enabling the contrast between the generated indicators and national and international indicators.

The reason for adoption of open innovation in the system pilot project occurred because the department did not have the necessary expertise to the platform development in area. The process of exploring external partners for the pilot project included the identification of possible partnerships with public universities in the state, especially, the Federal University of Amazonas (UFAM) that has the postgraduate program in the field of computer science and the Amazonas Research foundation (FAPEAM) it would invest funds through scholarships and support research.

4.3. Realization

In late 2010, the FAPEAM launches notice for the proposed contract for the development of the ST&I indicator system contemplating the scholarships and support research. The approved proposal was the responsibility of the Institute of Computing (Icomp) linked to the Federal University of Amazonas.

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The process of development indicator system required the participation of the three institutions (SECTI, FAPEAM and Icomp) for the design of the modules that would form the SiON. Thus, FAPEAM and SECTI, they were responsible for identifying indicators and databases where they were located and Icomp responsible for the creation of mechanisms for data collection. Therefore, the project collaboration network was composed by SECTI, FAPEAM and ICOMP which worked directly for the system development process.

Regarding the processes evaluation, the process development of SiON modules occurred from the control of time and implementation costs given the public nature of the investments being made up of seven stages, namely:

1. Module Analysis: perform the lifting module and specification of requirements. All the necessary functionality for the module, such as the data entry screens and indicators. The input manual data entry and automatic data through robots data collection. For the creation of these robots data collection is done a detailed study of the data sources. At this stage, they are also prepared databases with information already provided by the sources (IBGE, PINTEC and others);
2. Module Specification Validation: responsible for supplying the requirements for module creation approves the features defined by the software development team;
3. Implementation of the SiON module: is the creation of apparel SiON module, highly skilled computer professionals develop the system in accordance with the defined specification;
4. System Tests: always seeking to ensure the quality of the developed modules, tests are conducted as a way to verify the module implementation. In these tests can be seen whether the implementation correctly followed the validated specification;
5. Acceptance test: the module is presented to the client or group of people who will use the system. In this test all features are checked by these people as a way of validating the module in order to be delivered;

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6. User documentation: System manuals are prepared for others to use the system in the future. At this stage are prepared user manual and a tutorial with a description of all module features;
7. The module availability for the general public: after the acceptance test, the module is made available to the general public.

The approaches to knowledge management in the project involved the full support the dissemination, sharing and transfering of knowledge not only among the project partners but also all the results that could be achieved after its launch. The idea would be the full opening (access to the source code) to other institutions that have interest in adopting similar tool.

Thus, the System of Online Indicators in Science, Technology and Innovation of Amazonas (SION), was officially launched in 2012, consolidating its position as the leading management and advertising tool of ST&I policy underway in the Amazon. The system has been set up as an important management and public transparency tool as provides real-time indicators that allow the public manager making decisions based on reliable and consistent information with strategies outlined in the planning of institutional actions and social control, via internet, goals and implementation of budgets in each of the actions in progress.

In 2013, it was released version II of system with new features, with the recasting of the technical notes, review and inclusion of new indicators. Among the new modules stand out from the CNPq indicators and state expenditures indicators in ST&I. The system became more complete, presenting the results of the productivity of Amazonian researchers and state expenditures in the area.

4.4. Transfer of the Results

Regarding the transfer process, in 2013 the system source code has been transferred to another department of science and technology for implementation at the state level. The system led to internal organizational changes with regard to greater speed and reliability of data considering the need for presentation of ST&I indicators for society. The system became a tool for project development process to provide faster basis of the results that the state system of ST&I has achieved in recent years.

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During the project sources of internal resistance sources have not been identified, nor even in different relationships between partners to develop the system. For manual input data process in the system was necessary to standardize data collection methods on responsibility of SECTI.

4.5. Structure of SiON

The first version of SiON launched in 2012, was composed of four modules (human resources, financial resources, S&T activities and innovation activities) and nine areas, totaling 37 indicators of science, technology and innovation, as shown in Figure 2. Only the module "innovation activities" did not have subordinate areas.

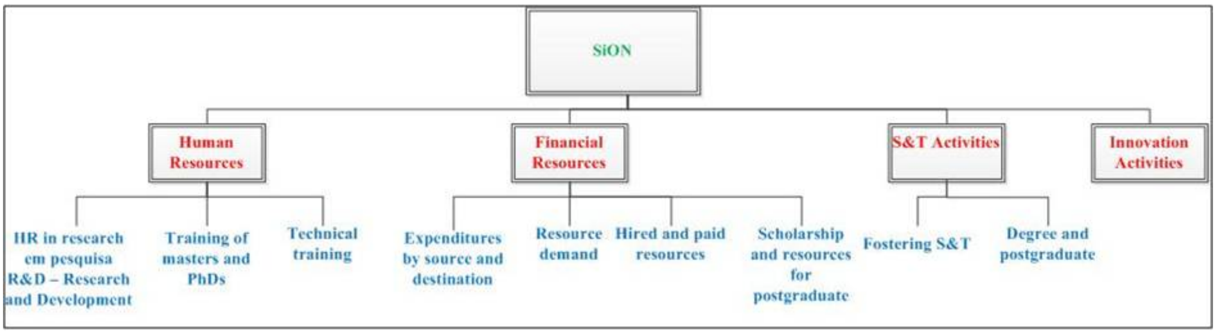

Figure 2: Structure (modules and areas) of the first version - SiON

The second version launched in 2013, consisted of new features, recasting of the technical notes, review and inclusion of new indicators. The new indicators and the revised are grouped into four new areas: (1) FAPEAM, (2) CNPq indicators, (3) state expenditures indicators in ST&I and (4) composite indicators.

The "FAPEAM" area is composed of 18 indicators that present data proposals, resources, costs, scholarships and other actions taken by the foundation. The "indicators of CNPq" area consists of six indicators dealing primarily scientific production of Amazonas from the CNPq Lattes database; the area of "composite indicators" is made up of 10 indicators that reflect various combinations of input indicators, proposals and expenses of FAPEAM. Finally, the area of "state expenditures in ST&I" shows the results of the state's investments in ST&I actions based on scientific, technical and related (ACTC) and research and development (R&D) developed by the State.

In conclusion, the third version released in 2014 the innovation module has changed going to have two new areas: (1) performance of industrial companies with regard to innovation and (2) Internal factors influencing innovation. In the module

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S&T activities included scientific and technological production area with information concerning the state of Amazonas.

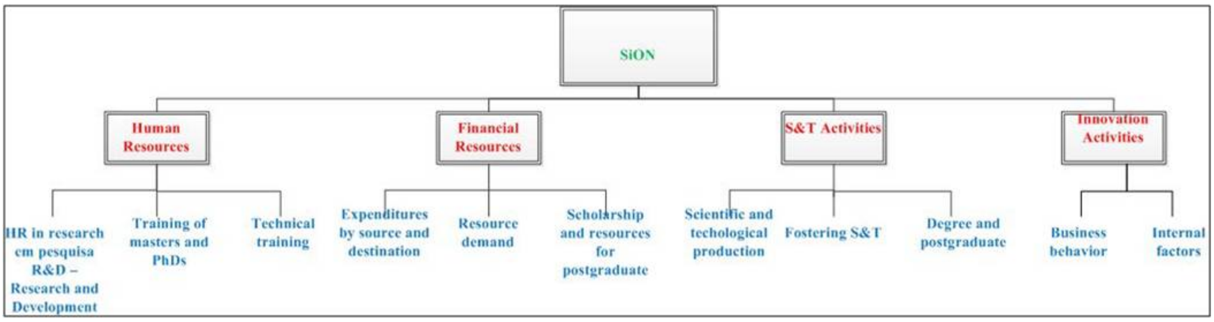

Figure 3: Structure (modules and areas) of the third version - SiON

5. DISCUSSION

Regarding the open innovation project analyzed, there is the adequacy of the institution to open innovative definition proposed in Lazzarotti & Manzini (2009) and demonstrated in the case studies in Boscherini *et al*. (2010) (1) initiate engagement of the pilot open innovation from a larger number of external partners (FAPEAM and ICOMP) higher than it would in a traditional design innovation; (2) make accessible to external actors participation in various stages of the innovation process; and (3) act in different organizational levels to facilitate access to the innovation process, resulting in increased management complexity.

The reasons for the adoption of open innovation are access to essential external expertise to deal with radical pilot projects which often require skills and knowledge from different areas (BOSCHERINI *et al*., 2010), in the case of the institution studied in conception phase was necessary to form partnerships with a view to acquiring knowledge and skills in face of external project complexity. Thus, the opening of the project has become the solution to achieve the goals.

Analogously to Boscherini *et al*. (2010), in the realization phase, the institution began changing its procedures and internal organization to better cope with open innovation the approach. The shared activities among the partners made it possible to optimize the innovation process and involvement of the institution in evaluation processes. The evaluation of the process resembled the stage-gate process served on Cooper (1994), which each phase for the development of system modules should be executed within stipulated time and costs. The study pilot project enabled new

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ways for knowledge management to provide the source code with other interested institutions.

During Transfer phase, the central question was not only to keep the know-how developed in open innovation management, but to transfer it to the procedures and routines of day-to-day. This transfer occurred by the delegation to a specific department responsible for monitoring future open innovation projects, in addition to sharing all information on the system design.

Thus, among the main findings stand out: first, building a system of indicators on line of science, technology and innovation would allow citizens to hold a follow-up of results from public policy in this area, more transparent to demonstrate the amounts invested in scholarships, support research, number of masters and doctors, among other data. Second, the involvement of FAPEAM, Icomp and SECTI in system design through the use of expertise in each institution, characterizing the pilot as open innovation. In conclusion, the possibility of the system to be shared with other institutions from the acquisition of the source code.

Regarding to the theoretical and empirical background, showed the importance that science, technology and innovation indicators have taken in recent decades and contribute to the discussion about the concepts and fundamental aspects of open innovation. From it was possible to characterize the institution as integrated collaborators under the open innovation modes explained in Lazzarotti & Manzini (2009). Regarding the archetypes proposed by Keupp & Gassmann (2009), the institution is characterized as explorers; adopted as a strategy for the development of SiON, used the pooled R&D/product development as proposed in West & Gallagher (2006).

The study confirms importance of the contributions of the various partners already observed in other studies, such as in Chiesa *et al*. (2004) who analyzed the process of outsourcing of R&D activities and Hoegel & Wagner (2005) investigated the collaborative relationship between buyer and supplier.

The advantages achieved with the opening of SiON development process found results presented in Berger *et al*. (2005), which explored new ways of cooperation between customers, retailers and manufacturers Resulting from co-design and Emden et al. (2006) who investigated the partner selection process to

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verify the potential of creating competitively advantageous products through collaboration.

The results observed in SiON project reinforce that even companies from mature and asset-intensive industries adopt the principles of open innovation. These results are equal to the work of Chesbrough & Crowther (2006) and Chiaroni *et al*. (2010).

Finally, because is a small institution, observed that open innovation in small and medium-sized enterprises (SMEs) has also been identified as Van Vrande *et al*. (2009) which explored open innovation practices in SMEs. The results showed that SiON open innovation process was determined by an individual decision instead of resulting feature the institution's operating area, reinforcing the results obtained in Lichtenthaler (2008).

Charter 1 provides a summary of open innovation project implemented compared the ratings in the literature review.

Charter 1: Comparing the SiON Project and literature ratings

Project/Rating	**Lazzarotti & Manzini (2009)**	**Keupp & Gassmann (2009)**	**West & Gallagher (2006)**
SiON Project	Integrated collaborators	Explorers	Pooled R&D/product development

The methodology used allowed a proper assessment of open innovation pilot project from the adoption of the approach proposed by Boscherini *et al*. (2010) where it was possible to view the construction of the indicator system (SiON) within the three phases of the approach. The approach rose to the evaluation and understanding of the pilot project in open innovation that led to the creation of SiON.

6. CONCLUSION

Open innovation enables organizations to the development of new products (goods or services), through cooperation between several partners, using the expertise of each one so that the end result benefits both internally and externally the creator of the idea. In this context, this study achieved its goal when evaluating the implementation of an open innovation project (SiON) in the State Secretary of Science, Technology and Innovation of Amazonas (SECTI).

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The results can be highlighted: (1) the construction of the system of online indicators of science, technology and innovation; (2) the external participation of partners in building the system through the use of knowledge and skills of each institution; (3) the ability to transfer the knowledge acquired during the project to other institutions of science, technology and innovation.

Among the limitations of research is the approach application in one institution statistically impossible to generalize in other public or private institutions with different characteristics. As suggestions for future studies, it should be adopted an approach in other institutions both public and private area through multiple case studies.

The research reinforces previous studies which open innovation requires an organization that is interested in managing technological relationships, developing internal and external knowledge; facing the barriers to innovation; and the challenges of organizational change process in order to achieve the strategic objectives. The study relevance based on an open innovation project evaluation in a public institution in order to foster the transition from traditional innovation processes to open innovation processes.

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